

Amendments to the Specification:

[0001] This application is a continuation of copending U.S. Application Serial No. 10/437,413 filed on May 13, 2003, which is a continuation-in-part application of U.S. Application Serial No. 10/155,636 filed on May 23, 2002, which is a continuation of U.S. Application Serial No. 09/645,975 filed on February 4, 2000, now U.S. Patent No. 6,422,415, which is a continuation of U.S. Application Serial No. 09/019,765 filed on February 6, 1998, now U.S. Patent No. 6,050,445, the disclosures of which are incorporated in their entirety herein by reference.

[0003] Enclosed cups having drinking spouts and air vents [[, which]] that allow the user to drink from the spout without creating excessive vacuum in the cup, are known in the art. However, drinking spouts and air vents are liable to leak liquid stored in the cup between feedings, or if dropped, shaken, or inverted during use. Accordingly, certain cups have been developed that use valving mechanisms at the spout and at the air vent. These valves respond to suction generated during feeding to open, [[and]] allowing liquid to pass through the spout and [[to]] allowing air to enter the air vent when a vacuum is developed in the interior of the cup.

[0004] Three patents disclosing such valves are U.S. Patent No. 5,079,013 to Belanger, U.S. Patent No. 5,542,670 to Morano, and U.S. Patent No. 6,050,445 to Manganiello, all of which are commonly owned by the assignee of the present application. Applicant has on the market a cup that employs a valve assembly that is shown in U.S. Patent No. 6,050,445. The valve assembly is secured to the underside of the lid or cap of the cup.

Applicant is also aware of a prior competitive product having a flow control element of the configuration depicted in Fig. 1, which ~~[[that]]~~ was sold as part of the Tumble Mates Spill Proof Cup by the First Years ®.

[0007] It is another object of the present invention to provide a flow control element in which the side of the element has a valve having an arcuate valve face.

[0010] It is a further object of the present invention to provide a flow control element in which the side of the element has opposed walls, ~~[[with]]~~ and one or more of the walls has ~~[[having]]~~ a valve therein.

[0019] Fig. 4 is a sectional view taken along the lines 3--3 in Fig. 2, with an alternate embodiment of a flow control element according to the present invention;

[0031] Cap 14 is formed with mating surfaces~~[[,]]~~ that are preferably adjacent to or incorporated into spout 16 and air vent 18, ~~[[to]]~~ and can frictionally engage flow control element 20 ~~[[and]]~~ to place the flow control element in fluid communication with spout 16 and air vent 18. In the embodiment depicted in Figs. 2 and 3, cap 14 is formed with cylindrical recesses 17 in spout 16 and below air vent 18. These recesses 17 are configured to accept flow control element 20.

[0032] Referring to Fig. 3, control element 20 has one or more stacks 24. Each stack 24 is substantially cylindrical, and the resulting inner contour presents a simple, wide opening cylinder to enable thorough cleaning of the stack after use and to minimize the number of corners and niches in which dried or

congealed liquid can be deposited. It is preferred that the outer contour of stacks 24 be stepped, as shown in Figs. 3 and 4, but that the inner contour of the stacks be a constant diameter or of constantly diminishing diameter, thus presenting a smooth, unstepped inner face. Thus, the smooth inner face is preferably either cylindrical, frustoconical, or a combination of the two. This smooth inner face further enhances free fluid flow and promotes easy cleaning of stack 24. The fact that this flow control element 20 is easy to clean is very important both to the proper and sanitary functioning of the assembly 10, and also to consumer acceptance of the element.

[0033] In the embodiment shown in Fig. 3, each stack 24 of control valve 20 has a concave shaped upper valve face 30, preferably with the attendant curved shape of slits 32. It has been found that elongated single slits 32 are [[preferred]] preferable to cross-cuts or other types of apertures through valve faces 30. It is also preferred that slits 32 extend substantially from edge to edge of concave valve faces 30.

[0034] The most preferred length of slit 32 that is aligned with spout 16, is about 0.235 inches. The most preferred length of slit 32 that is aligned with air vent 18, is about 0.17 inches. The most preferred inner diameter of the stack 24 that is aligned with spout 16, is from about 0.299 inches to about 0.368 inches, ideally a frustoconical shape having the foregoing as minimum and maximum diameters. The most preferred inner diameter of the stack 24 that is aligned with air vent 18, is from about 0.247 inches to about 0.300 inches, and is ideally a frustoconical shape having the foregoing as minimum and maximum diameters. The most preferred height of the stack 24 that is aligned with spout 16, is about 0.803 inches from top to bottom,

and about 0.521 inches from indentation to bottom. The most preferred height of the stack 24 that is aligned with air vent 18, is about 0.73 from top to bottom, and about 0.55 from indentation to bottom. The two stacks 24 are preferably 1.6 inches on center. The preferred outer diameter of the lower portion 26 of the stack 24 that is aligned with spout 16, is about 0.545 inches. The preferred outer diameter of the lower portion 26 of the stack 24 that is aligned with air vent 18, is about 0.490 inches. These dimensions provide a friction fit with a cup lid having cylindrical recesses 17 having preferred inner diameters of about 0.499 inches and about 0.439 inches, respectively. All of the foregoing measurements are subject to a preferred tolerance of plus or minus about 0.005 inches.

[0035] It is preferred that the flow control element 20 ~~[[be]]~~ is formed from a single piece of elastomeric material, which ~~[[to]]~~ facilitates easy insertion into and removal from recesses 17. However, flow control element 20 can be formed of two separate valving elements or stacks 24, each adapted to be inserted into recesses 17 or otherwise engage cap 14. The elastomeric material used is most preferably silicone, but TPE (thermoplastic elastomer), natural rubber, and synthetic rubber (e.g., isoprene) are also preferred.

[0038] First stack 124 is disposed proximate to spout 116 and second stack 144 is disposed proximate to air vent 118. The first and second stacks 124, 144 can selectively place cup 112 in fluid communication with apertures 119 of spout 116 and air vent 118, respectively. In some embodiments, control element 120 has only a single stack, namely first stack 124 that mates with a single mating member or other device for attaching the valve stack to cap 114, yet permits the selective flow of liquid

from the cup 112 to spout 116 and permits selective flow of venting air into the cup through the spout.

[0043] Lower portions 126, 146 are pressed into mating members 115, 117, respectively, until retaining rims 132, 152 are received about and form a friction fit with the outside surface of mating members, respectively. Thus, retaining rims 132, 152 allow each stack 124, 144 to form a friction fit with both the inside and outside of mating members 115, 117. Further, lower portions 126, 146 can be pressed into mating members 115, 117, respectively, until retaining rims 132, 152 are received [[recevied]] about the mating members so that the rims engage three sides (e.g., inside, outside, and bottom) of the mating members.

[0049] Slit 140 is a normally closed slit defined in valve face 138. Slit 140 can be positioned in face 138 in any selected orientation. For example, in the illustrated embodiment, slit 140 has a substantially vertical orientation. In vertical orientation, the elongated extent of slit 140 is generally along an axis of flow 143 of the liquid. Of course, slit 140 with other orientations, such as, but not limited to, substantially horizontal (e.g., normal to axis 143) or an angled orientation, are contemplated for use with the present invention.

[0051] Also, valve face 138 is described herein by way of example as being substantially planar with a slightly [[an]] arcuate curvature. Of course, faces having other configurations such as, but not limited to, non-planar faces are contemplated. For example, face 138 [[can]] and sidewall 136 can be one-in-the-same.

[0056] The most preferred length of slit 140 that is aligned with spout 116, is about 0.205 inches. The most preferred inner diameter of first stack 124 that is aligned with spout 116, is from about 0.314 inches to about 0.360 inches. Also preferably, first stack 124 has a frustoconical shape. The most preferred height of first stack 124 that is aligned with spout 116, is about 0.884 inches from top to bottom.

[0058] The most preferred length of slit 160 that is aligned with air vent 118, is about 0.205 inches. The most preferred inner diameter of second stack 144 that is aligned with air vent 118, is from about 0.268 inches to about 0.294 inches. As with first stack 124, the shape of second stack 144 is preferably frustoconical. The most preferred height of second stack 144 that is aligned with air vent 118, is about 0.487 from top to bottom.

[0071] Slit 240 is a normally closed slit defined in valve face 238. Slit 240 can be positioned in face 238 in any selected orientation. For example, in the illustrated embodiment, slit 240 has a substantially vertical orientation. Of course, slit 240 with other orientations, such as, but not limited to, substantially horizontal or an angled orientation, are contemplated for use with the present invention. Also, first valves 234 can each include multiple slits 240 in a cross-slit orientation or possibly an aperture, however, the latter is less preferred.

[0072] Also, valve face 238 is described herein by way of example as being substantially planar. Of course, non-planar valve faces are contemplated. Further, each stack 224, 244 is described herein by way of example as having only one valve

face. Of course, more than one valve face on either or both of the stacks is contemplated by the present invention.

[0075] The most preferred length of slit 240 that is aligned with the spout₁ is about 0.205 inches. The most preferred inner diameter of first stack 224 that is aligned with the spout₁ is from about 0.340 inches to about 0.425 inches. Also preferably, first stack 224 has a frustoconical shape. The most preferred height of first stack 224 that is aligned with the spout₁ is about 0.830 inches from top to bottom.